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Patent Application
Attorney Docket No. D/99531

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Shadi L. Malhotra
Application No.: 09/404,570
Filed: September 23, 1999
Examiner: C. Shosho
Art Unit: 1714
Title: **HOT MELT INKS CONTAINING ALDEHYDE COPOLYMERS**

CERTIFICATE OF MAILING

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August 3, 2001
(Date of deposit)

Cathy Whitney
(Name of applicant, assignee, or Registered Representative)

(Signature)

August 3, 2001
Date of Signature

Commissioner for Patents
Washington, D.C. 20231

Sir:

LETTER

Enclosed herewith is an original and two copies of Appellants' Brief on Appeal in the above-identified application.

Please charge any fees associated with the filing of the Brief on Appeal to Xerox Corporation, Deposit Account No. 24-0025. Two duplicate copies of this letter are enclosed.

Respectfully submitted,

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PATENT APPLICATION

ATTORNEY DOCKET NO. D/99531

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

SHADI L. MALHOTRA

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Application for Patent

Application No.: 09/404,570 : Examiner: C. Shosho

Filed: September 23, 1999 : Art Unit: 1714

HOT MELT INKS CONTAINING ALDEHYDE COPOLYMERS

BRIEF ON APPEAL

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1. **REAL PARTY IN INTEREST:**

Xerox Corporation, assignee of the present patent application.

2. **RELATED APPEALS AND INTERFERENCES:**

While the inventions in Copending Application U.S. Serial No. 09/401,740 and Copending Application U.S. Serial No. 09/401,250 are essentially unrelated to the invention of the instant application in that they are directed to

> a hot melt ink composition comprising (a) a styrene polymer or terpene polymer hardening component, (b) a nonpolymeric aromatic viscosity modifier, (c) a colorant, (d) an optional nonpolymeric aromatic ink vehicle, (e) an optional colorant dispersing agent, (f) an optional conductivity enhancing agent, (g) an optional antioxidant, and (h) an optional UV absorber

and

> a hot melt ink composition comprising (a) a polyester ink vehicle which is poly(hexamethylene sebacate), poly(1,6-hexamethylene adipate), poly(vinyl cinnamate), poly(vinyl stearate), polyethylene succinate, polyethylene terephthalate, poly(vinylacetate-co-crotonic acid), sucrose octaacetate, poly(di(ethyleneglycol)/cyclohexanedimethanol-*alt*-isophthalic acid, sulfonated), or mixtures thereof, (b) a nonpolymeric ester viscosity modifier, (c) a colorant, (d) an optional colorant dispersing

agent, (e) an optional conductivity enhancing agent, (f) an optional antioxidant, and (g) an optional UV absorber

respectively, all three applications are currently being appealed from decisions by the same Examiner, and some of the references cited against the present application have also been cited against these applications.

3. STATUS OF CLAIMS:

Claims 1 to 21, 23, and 24 are rejected.

Claim 22 is allowed.

4. STATUS OF AMENDMENTS:

Appellant's Amendment After Final Rejection dated April 17, 2001 was considered by the Examiner but did not overcome the rejections.

5. SUMMARY OF INVENTION:

Appellant's invention is directed to a hot melt ink composition comprising (a) an aldehyde copolymer ink vehicle, (b) a nonpolymeric aldehyde viscosity modifier, (c) a colorant, (d) an optional

conductivity enhancing agent, (e) an optional antioxidant, and (f) an optional UV absorber.

6. ISSUES:

A. Whether claims 1 to 5, 8 to 13, and 17 to 21 are patentable under 35 U.S.C. §103(a) over Malhotra et al. (U.S. Patent 5,931,995) in view of either Schwarz et al. (U.S. Patent 5,122,187) or Siddiqui (U.S. Patent 5,939,468), Watt (U.S. Patent 4,105,806), and Takazawa et al. (U.S. Patent 5,279,655).

B. Whether claims 6 and 16 are patentable under 35 U.S.C. §103(a) over Malhotra et al. in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al. and further in view of Tobias et al. (U.S. Patent 5,286,288).

C. Whether claim 7 is patentable under 35 U.S.C. §103(a) over Malhotra et al. in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al. and further in view of Nishizaki et al. (U.S. Patent 6,022,910).

D. Whether claims 14 and 15 are patentable under 35 U.S.C. §103(a) over Malhotra et al. in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al. and further in view of Shacklette (U.S. Patent 5,378,403) and WO 93/22775.

E. Whether claims 23 and 24 are patentable under 35 U.S.C. §103(a) over Malhotra et al. in view of Watt.

7. GROUPING OF CLAIMS:

The rejected claims do not stand or fall together. Appellant will discuss distinctions between all of the appealed claims and the cited references as indicated in the headings hereinbelow. In addition, claims 4 and 10 are discussed separately with respect to the cited art under Heading A.

8. ARGUMENT:

The present invention is directed to a hot melt ink composition comprising (a) an aldehyde copolymer ink vehicle, (b) a nonpolymeric aldehyde viscosity modifier, (c) a colorant, (d) an optional conductivity enhancing agent, (e) an optional antioxidant, and (f) an optional UV absorber. Advantages of the present invention include suitability for use in acoustic ink printing processes, desirable conductivity values, desirable melting point values, melt viscosities at jetting temperatures that enable high quality ink jet printing, generation of images with excellent hardness values, change from a solid state to a liquid state in a desirably rapid period of time upon heating, desirable acoustic loss values for acoustic ink printing, desirable conductivity values for electric field assisted acoustic ink printing, generation of

images with desirably low haze values, generation of images with good crease resistance, generation of images with high gloss, high solubility of dye colorants in the inks, thereby enabling prints with desirably high optical density using smaller amounts of the ink, and enabling thinner images of the ink on the substrate, generation of images with excellent scratch resistance, and other advantages as set forth in the specification and illustrated in the examples.

A. Whether claims 1 to 5, 8 to 13, and 17 to 21 are patentable under 35 U.S.C. §103(a) over Malhotra et al. (U.S. Patent 5,931,995) in view of either Schwarz et al. (U.S. Patent 5,122,187) or Siddiqui (U.S. Patent 5,939,468), Watt (U.S. Patent 4,105,806), and Takazawa et al. (U.S. Patent 5,279,655).

Malhotra et al. discloses an ink comprising (1) a liquid aldehyde, a liquid acid, or mixtures thereof, (2) a solid additive aldehyde compound, a solid additive acid compound, or mixtures thereof, (3) a lightfastness UV absorber, (4) a lightfastness antioxidant, and (5) a colorant.

Schwarz et al. discloses hot melt ink compositions suitable for ink jet printing which comprise a colorant, a binder, and a propellant selected from the group consisting of hydrazine; cyclic amines; ureas; carboxylic acids; sulfonic acids; aldehydes; ketones; hydrocarbons; esters; phenols; amides; imides; halocarbons; urethanes; ethers; sulfones; sulfamides; sulfonamides; phosphites; phosphonates; phosphates; alkyl sulfides; alkyl acetates; and sulfur dioxide. Also disclosed are hot melt ink compositions suitable for ink jet printing which comprise a colorant, a propellant, and a binder selected from the group

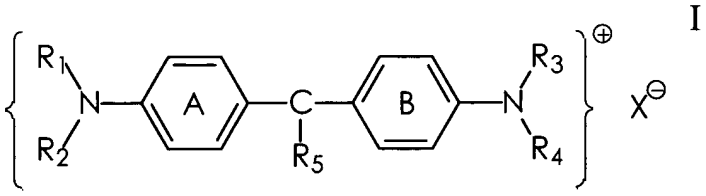
consisting of rosin esters; polyamides; dimer acid amides; fatty acid amides; epoxy resins; fluid paraffin waxes; fluid microcrystalline waxes; Fischer-Tropsch waxes; polyvinyl alcohol resins; polyols; cellulose esters; cellulose ethers; polyvinyl pyridine resins; fatty acids; fatty acid esters; poly sulfonamides; benzoate esters; long chain alcohols; phthalate plasticizers; citrate plasticizers; maleate plasticizers; sulfones; polyvinyl pyrrolidinone copolymers; polyvinyl pyrrolidone/polyvinyl acetate copolymers; novalac resins; natural product waxes; mixtures of linear primary alcohols and linear long chain amides; and mixtures of linear primary alcohols and fatty acid amides. In one embodiment, the binder comprises a liquid crystalline material.

Siddiqui discloses jet ink compositions suitable for producing marks on objects that are invisible to the unaided eye and are visible only when excited by an exciting radiation comprising a solvent, a fluorescent colorant, a binder resin, and a plasticizer having a vapor pressure of about 15 mm Hg or less at 240°C. Examples of suitable binder resins include an acrylic resin, a toluenesulfonamide resin, and a sulfonamide-formaldehyde resin. An example of a suitable plasticizer is o-butyl benzyl phthalate. The marks are blush resistant when exposed to water at 150°F and above for 5 minutes. Also disclosed is an improved method of identifying objects, the improvement comprising providing a blush resistant identifying mark using the inventive jet ink compositions. A system for identifying objects with a blush resistant identification mark is also disclosed.

Watt discloses photoinitiator-free inks and a method of producing printed and varnished surfaces by depositing a base film or

printing on a substrate and depositing, wet-on-wet, a protective varnish or top coat after which the multilayers are exposed to an energy source, preferably to electromagnetic radiation, to cure simultaneously the varnish and ink on said substrate.

Takazawa et al. discloses a printer ink composition containing a triphenylmethane dye or a lake pigment derived therefrom as a coloring agent, including as the coloring agent a triphenylmethane dye having general formula (I):



I

wherein R_1, R_2, R_3, and R_4 are independently a hydrogen atom, an alkyl group, an aralkyl group, or an aryl group, R_5 is an aryl group, X^- is a counter ion, and ring A or ring B may be substituted by one or more substituents, provided that at least one group among R_1, R_2, R_3, and R_4 is not methyl and in the case that R_5 is p-dimethylaminophenyl, at least one of R_1 and R_2 and at least one of R_3 and R_4 are not methyl; or a lake pigment derived therefrom, in order to prevent the formation of Michler's ketone. The ink composition is used for printing media for printer such as fabric ink ribbon, ink roll, ink-retaining element, thermal transfer ink ribbon, and pressure-sensitive transfer ink ribbon.

The Examiner has stated that Malhotra et al. discloses a hot melt ink possessing melting temperature of 125 to 160°C, melt viscosity of 5 to 20 centipoise, and acoustic loss value of less than 100 decibels per millimeter, that this ink contains colorant such as a dye or

pigment, 0.5 to 10 percent antioxidant, and UV absorber, that the reference also discloses an acoustic ink jet printing process, that the reference discloses the use of 1 to 55 percent compounds such as benzaldehyde, 3-methoxy benzaldehyde, 4-methoxy benzaldehyde, 3-methyl benzaldehyde, 2-hydroxy benzaldehyde, cinnamaldehyde, and 5 to 97 percent compounds such as 2,3,4-trimethoxybenzaldehyde, 3,5-dimethoxy benzaldehyde, 2,5-dimethoxy benzaldehyde, and 3-benzyloxy benzaldehyde, that while Malhotra et al. discloses 2,3,4-trimethoxybenzaldehyde, 2-hydroxy benzaldehyde, and 3-benzyloxy benzaldehyde, the present claims require either 2,3,5-trimethoxybenzaldehyde, 2,3,6-trimethoxybenzaldehyde, 2,4,5-trimethoxybenzaldehyde, 2,4,6-trimethoxybenzaldehyde, 3-hydroxy benzaldehyde, 4-hydroxy benzaldehyde, or 4-benzyloxy benzaldehyde, that in each case, the only difference between the reference compounds and those presently claimed are the position of the substituents, i.e., ortho, meta, or para, that absent any evidence of criticality, one of ordinary skill in the art would expect the benzaldehyde to function in the same manner regardless of the position of the substituents, and that Malhotra et al. broadly discloses the use of benzaldehydes and 3-methoxy benzaldehyde while the present claims require more specific types of benzaldehydes such as 4-hydroxy-3-methoxy benzaldehyde, but that one of ordinary skill in the art would have recognized that the broad disclosure of benzaldehyde or 30methoxy benzaldehyde encompasses the use of specific types of these compounds such as those presently claimed, and that the choice

of these specific types of compounds would have been within the bounds of routine experimentation.

Appellant is assuming that the Examiner's comments regarding specific aldehyde compounds refer to claim 10, since this claim is the only one in the present application that recites specific nonpolymeric aldehydes. Appellant points out that Malhotra et al. is directed to an ink containing both a liquid aldehyde or acid and a solid aldehyde or acid in addition to the other disclosed ink components, and that most of the compounds referred to by the Examiner, namely benzaldehyde, 3-methoxy benzaldehyde, 4-methoxy benzaldehyde, 3-methyl benzaldehyde, 2-hydroxy benzaldehyde, and trans-cinnamaldehyde, are disclosed in Malhotra et al. as examples of liquid aldehydes, and that 2,3,4-trimethoxybenzaldehyde, 3,5-dimethoxy benzaldehyde, 2,5-dimethoxy benzaldehyde, and 3-benzyloxy benzaldehyde are disclosed in Malhotra et al. as examples of solid aldehydes. In contrast, the materials recited in claim 10 are all solids at room temperature; more specifically:

3-hydroxy benzaldehyde: 103-105°C
4-hydroxy benzaldehyde: 117-119°C
4-benzyloxy benzaldehyde: 72.5-74°C
2-carboxy benzaldehyde: 96-98°C
4-nitro benzaldehyde: 105-108°C
2,3-dihydroxy benzaldehyde: 108-110°C
2,5-dihydroxy benzaldehyde: 100-103°C
3-hydroxy-4-methoxy benzaldehyde: 113-115°C
4-hydroxy-3-methoxy benzaldehyde: 81-83°C
4-hydroxy-3-ethoxy benzaldehyde: 76-78°C
4-hydroxy-3-methyl benzaldehyde: 118-120°C
2-hydroxy-5-nitrobenzaldehyde: 128-130°C
3-hydroxy-4-nitrobenzaldehyde: 132-134°C
4-hydroxy-3-nitrobenzaldehyde: 140-142°C

3,4-dibenzyloxy benzaldehyde: 91-94°C
3,5-dibenzyloxy benzaldehyde: 78-80°C
4-acetoxy-3,5-dimethoxy benzaldehyde: 115-117°C
2-amino-3,5-dibromo benzaldehyde: 130-135°C
2-benzyloxy-4,5-dimethoxy benzaldehyde: 138-141°C
5-bromo-2-hydroxy-3-methoxy benzaldehyde: 125-127°C
4-hydroxy-3,5-dimethoxy benzaldehyde: 110-113°C
2,3,5-trichlorobenzaldehyde: 73-75°C
2,3,6-trichlorobenzaldehyde: 87-89°C
2,4,5-trimethoxy benzaldehyde: 112-114°C
2,4,6-trimethoxy benzaldehyde: 118-120°C
3,5-dichloro-2-hydroxy-benzaldehyde: 95-97°C
3,5-dibromo-2-hydroxy-benzaldehyde: 82-83.5°C
3,5-diiodo-2-hydroxy-benzaldehyde: 109-110°C
3,4-dihydroxy-5-methoxy benzaldehyde: 131-134°C
3,5-dimethyl-4-hydroxy benzaldehyde: 112-114°C
2,6-dimethoxybenzaldehyde: 96-98°C
2-nitro cinnamaldehyde: 127-129°C
4-(diethylamino) cinnamaldehyde: 74-76°C
4-acetoxy-3-methoxy cinnamaldehyde: 97-100°C
4-hydroxy-3-methoxy cinnamaldehyde: 80-82°C
2-hydroxy-1-naphthaldehyde: 82-85°C
2-methoxy-1-naphthaldehyde: 82-85°C
9-anthraldehyde: 104-105°C
5-bromo-2-furaldehyde: 82-85°C
5-nitro-2-thiophene carboxaldehyde: 75-77°C
9-ethyl-3-carbazole carboxaldehyde: 85-87°C
4-stilbene carboxaldehyde: 112-114°C
2-hydroxy-5-methyl-1,3-benzene dicarboxaldehyde: 128-130°C
terephthal dicarboxaldehyde: 115-116°C
2-(diphenylphosphino) benzaldehyde: 112-115°C
1-(phenylsulfonyl)-2-pyrrolecarboxaldehyde: 81-82°C
1-pyrene carboxaldehyde: 123-126°C
phenanthrene carboxaldehyde: 100-103°C
2-fluorenecarboxaldehyde: 85-86°C

Accordingly, this reference cannot be said fairly to teach or suggest the use of the materials recited in claim 10 in an ink according to the present invention, which also contains an aldehyde copolymer ink vehicle.

The Examiner has stated that the difference between Malhotra et al. and the present claimed invention is the requirement in the claims of (a) viscosity modifier, (b) aldehyde copolymer, and (c) time necessary for ink to change from solid to liquid.

With respect to difference (a), the Examiner has stated that Malhotra et al. discloses benzaldehyde compounds as presently claimed but does not explicitly refer to these compounds as viscosity modifiers, but that given that the reference compounds are the same type as the compounds presently claimed, i.e., benzaldehydes, it would have been natural for one of ordinary skill in the art to infer that the reference compounds intrinsically function as viscosity modifiers, and thereby arrive at the claimed invention.

Appellant disagrees with this position. As stated in the instant application, the viscosity modifier generally acts to lower the viscosity of the ink at the jetting temperature, typically lowering the viscosity by from about 10 to about 20 centipoise compared to a similar composition containing no viscosity modifier, although the quantitative viscosity adjustment can be outside of this range. Nothing in Malhotra et al. teaches or suggests to one of ordinary skill in the art that nonpolymeric aldehyde compounds would function as viscosity modifiers in ink compositions containing an aldehyde copolymer ink vehicle. Accordingly, Appellant is of the position that the present invention is patentable with respect to this reference.

With respect to difference (b), the Examiner has stated that Siddiqui, which is drawn to ink jet inks, discloses the use of 12 to 35 percent toluenesulfonamide-formaldehyde resin to improve the

adhesion of the ink to the substrate, and that in light of the motivation for using aldehyde copolymers disclosed by Siddiqui, it would have been obvious to one of ordinary skill in the art to use this copolymer in the ink composition of Malhotra et al. to produce an ink with improved adhesion to the substrate, thereby arriving at the claimed invention.

Appellant disagrees with this position. Siddiqui is directed to a liquid ink jet ink composition, with a viscosity of from about 1.6 to about 7.0 centipoise at 25°C. Nothing in this reference teaches or fairly suggests to one of ordinary skill in the art that a toluenesulfonamide-formaldehyde resin should be used as the vehicle in a solid, or hot melt, or phase change ink, or that a hot melt ink comprising a toluenesulfonamide-formaldehyde resin in combination with a nonpolymeric aldehyde viscosity modifier and a colorant would be desirable. Accordingly, Appellant is of the position that this reference, viewed either alone or in combination with Malhotra et al., fails to render obvious the present invention as recited in claims 1 to 5, 8 to 13, and 17 to 20.

Further with respect to difference (b), the Examiner has stated that Watt, which is drawn to ink compositions, discloses the use of polyglycidyl ethers of formaldehyde as a binder, and that in light of the motivation for using aldehyde copolymers disclosed by Watt, it would have been obvious to one of ordinary skill in the art to use this copolymer in the ink composition of Malhotra et al. to produce an ink with improved adhesion to the substrate, thereby arriving at the claimed invention.

Appellant disagrees with this position. Watt is directed to a curable ink composition which is applied along with a protective

varnish or top coat in a wet-on-wet deposition process. Nothing in this reference teaches or fairly suggests to one of ordinary skill in the art that a polyglycidyl ether of formaldehyde should be used as the vehicle in a solid, or hot melt, or phase change ink, or that a hot melt ink comprising a polyglycidyl ether of formaldehyde in combination with a nonpolymeric aldehyde viscosity modifier and a colorant would be desirable. Accordingly, Appellant is of the position that this reference, viewed either alone or in combination with Malhotra et al., fails to render obvious the present invention as recited in claims 1 to 5, 8 to 13, and 17 to 20.

With respect to difference (c), the Examiner has stated that although there is no explicit disclosure of the time required to change the ink from a solid state to a liquid state, given that the melting temperature of Malhotra et al.'s ink overlaps the melting temperature presently claimed, it is natural to infer that Malhotra et al.'s ink will intrinsically change from solid to liquid in the same amount of time as presently claimed.

Appellant is assuming that the Examiner's comments regarding the time required to change the ink from a solid state to a liquid state refer to claim 4, since this claim is the only one in the present application that recites such time periods. Appellant disagrees with the Examiner's position. The melting point of a substance and the amount of time required for that substance to change from a solid to a liquid at the melting point are two entirely different characteristics of the substance. Nothing in Malhotra et al. teaches or suggests a hot melt ink that undergoes, upon heating, a change from a solid state to a liquid state in

a period of no more than about 100 milliseconds. Accordingly, Appellant is of the position that claim 4 is particularly in condition for allowance with respect to this reference.

With respect to Schwarz et al., the Examiner has stated that this reference, which is drawn to hot melt inks, discloses the use of 10 to 90 percent aldehyde copolymer, namely formaldehyde-toluene sulfonamide, which functions both as a binder to provide printed images with flexibility to prevent cracking and creasing, and as a propellant to enhance ejection of the ink from the ink jet printer.

Appellant points out that nothing in this reference, however, teaches or suggests that an aldehyde copolymer should be combined with a nonpolymeric aldehyde viscosity modifier and a colorant to make a hot melt ink. Accordingly, Appellant is of the position that the present invention is patentable with respect to this reference viewed in combination with Malhotra et al., Siddiqui, Watt, and Takazawa et al.

In response to Appellant's position to the effect that there is no disclosure in Schwarz et al. of combining aldehyde copolymers with nonpolymeric viscosity modifiers, the Examiner has stated that it is agreed that Malhotra et al. does not disclose aldehyde copolymers as presently claimed, and that Schwarz et al. does not disclose nonpolymeric viscosity modifiers as presently claimed, which is why these references are used in combination, that the ink of Malhotra et al. is open to the inclusion of other ingredients and nothing in Malhotra et al. negates against using ingredients such as an aldehyde copolymer, that Schwarz et al. is cited to teach a specific concept, namely that

aldehyde copolymers are conventionally known to be used in hot melt inks to provide images with flexibility to prevent cracking and creasing, and in combination with Malhotra et al. discloses the present invention, and that absent evidence to the contrary, it would have been obvious to one of ordinary skill in the art to use the aldehyde copolymer of Schwarz et al. in the ink of Malhotra et al. and thereby arrive at the claimed invention.

Appellant disagrees with this position. Appellant again points out that the burden of establishing a case of obviousness rests with the Examiner, and that the Examiner may not make an assertion, unsupported by facts, of unpatentability and require Appellant to provide evidence to rebut the assertion. The PTO has the burden under section 103 to establish a prima facie case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. In re Fine, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988); In re Newell, 891 F.2d 899, 13 U.S.P.Q. 2d 1248 (Fed. Cir. 1989). Ex Parte Levengood, 28 U.S.P.Q. 2d 1300 (Bd. Pat. App. & Int. 1993). Nothing in any of the cited references would lead one of ordinary skill in the art to view them in combination. Further, even if these references were viewed in combination, the combined teachings thereof would not lead one of ordinary skill in the art to arrive at the instant invention.

In response to Appellant's position to the effect that Siddiqui and Watt are directed to liquid inks while Malhotra et al. is directed to hot melt inks, the Examiner has stated that, as disclosed in

Takazawa et al., the ingredients for liquid inks and solid inks overlap, as disclosed at column 6, lines 43 to 52 and column 7, lines 65 to 68, and is accordingly of the position that there is ample motivation to combine Siddiqui and Watt with Malhotra et al.

Appellant disagrees with this position. Takazawa et al. is primarily directed to a specific colorant, and discloses the use of this colorant in various types of materials, including liquid inks, thermal transfer ribbons, and pressure sensitive transfer ribbons. The reference clearly states at column 7, lines 56 and 57, that "[h]ereinafter, the solid ink composition of the present invention will be explained." (emphasis added) At column 7, lines 65 to 68, the reference states that "[w]ith respect to the solid ink for such uses, conventional vehicles and others can be used without any particular change except that the specified coloring agent as mentioned above is used as the coloring agent." Immediately thereafter, in column 8, lines 1 to 23, the reference states: "Hereinafter, a first explanation will be given for the one-time thermal transfer ink ribbon. The vehicle of solid ink for the ribbon is preferably a vehicle composed of a wax-like substance as a main component or a vehicle composed of a mixture of a wax-like substance and a thermoplastic resin as a main component. Examples of the wax-like substance include natural waxes such as carnauba wax, whale wax, haze wax, bees wax, lanolin, montan wax and ceresine wax; petroleum waxes such as paraffin wax and microcrystalline wax; synthetic waxes such as low molecular weight polyethylene, oxidized wax and ester wax; higher fatty acids such as lauric acid, myristic acid, palmitic acid, stearic acid and behenic acid; higher aliphatic alcohols such as stearyl alcohol

and behenyl alcohol; esters such as higher fatty acid monoglycerides, sucrose fatty acid esters and sorbitan fatty acid esters; and amides such as oleic amide. One or more kinds of these wax-like substances are appropriately used. Examples of the thermoplastic resin include ethylene-vinyl acetate copolymer, petroleum resin, polyvinyl acetate, polystyrene, styrene-butadiene copolymer and acrylic resin. One or more kinds of these resins are appropriately used." (emphasis added) Subsequent portions of the reference discuss inks for use in multi-use thermal transfer ribbons, one-time use pressure-sensitive ribbons, and multi-use pressure-sensitive ribbons. The statement at the bottom of column 7 to the effect that "conventional vehicles and others can be used without any particular change except that the specified coloring agent as mentioned above is used as the coloring agent" clearly refers to conventional vehicles commonly used in one-time use and multi-use thermal transfer and pressure-sensitive transfer ribbons, as discussed at the top of column 8 and subsequent portions of the reference, and does not refer to conventional vehicles commonly used in liquid inks, which were discussed previously in the reference. Liquid ink jet inks and solid ink jet inks have different characteristics, different requirements, and different design difficulties; those of ordinary skill in the art would not be led to the conclusion that one specific component of one specific liquid ink should be taken and added to another specific solid ink, or that by so doing advantageous results would occur. Appellant accordingly maintains that there is no motivation for one of ordinary skill in the art to combine the teachings of Malhotra et al., which is directed to a hot melt

ink, with the teachings of Siddiqui or Watt, which are directed to liquid inks.

Further in response to Appellant's position to the effect that there is no motivation to combine either Siddiqui or Watt with Malhotra et al. given that Malhotra et al. is drawn to solid inks and both Siddiqui and Watt are drawn to liquid inks, the Examiner has stated that Appellant has provided no clear and convincing evidence that components present in liquid ink jet inks cannot be added to solid ink jet inks, and that Siddiqui and Watt are used as teaching references, so it is not necessary for these secondary references to contain all the features of the presently claimed invention. The Examiner has stated that these references each teach a certain concept, and in combination with the primary reference, disclose the presently claimed invention.

Appellant disagrees with this position. Appellant points out that the burden of establishing a case of obviousness rests with the Examiner, and that the Examiner may not make an assertion, unsupported by facts, of unpatentability and require Appellant to provide evidence to rebut the assertion. In ex parte prosecution, the PTO has the burden of producing a factual basis for a rejection. In re Piasecki, 745 F.2d 1468, 223 U.S.P.Q. 785 (Fed. Cir. 1984); In re Gordon, 733 F.2d 900 (Fed. Cir. 1984). As the Court of Appeals for the Federal Circuit stated in In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984): 'The Supreme Court in Graham v. John Deere Co., 383 U.S. 1, 148 U.S.P.Q. 459 (1966), focused on the procedural and evidentiary processes in reaching a conclusion under section 103. As adapted to ex parte procedure, Graham is interpreted as continuing to place the 'burden of

proof on the Patent Office which requires it to produce the factual basis for its rejection of an application under sections 102 and 103'. In re Warner, 379 F.2d 1011, 1016, 154 USPQ 173, 177 (CCPA 1967)." The Examiner cannot require Appellant to "provide . . . clear and convincing evidence that components present in liquid ink jet inks cannot be added to solid ink jet inks". The references cited by the Examiner fail to teach or suggest to one of ordinary skill in the art the ink compositions recited in the instant claims. The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. In re Fine, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988); In re Newell, 891 F.2d 899, 13 U.S.P.Q. 2d 1248 (Fed. Cir. 1989); Ex Parte Levengood, 28 U.S.P.Q. 2d 1300 (Bd. Pat. App. & Int. 1993). The Examiner has failed to make such a showing. Appellant, accordingly, is of the position that the present invention is patentable with respect to the teachings of these references.

In response to Appellant's position to the effect that Malhotra et al. is directed to an ink containing both a liquid aldehyde or acid and a solid aldehyde or acid in addition to the other disclosed ink components, whereas the materials recited in claim 10 are all solids at room temperature, the Examiner has stated that present claims 1 and 21 require only a nonpolymeric aldehyde viscosity modifier, that there is no requirement in these claims that the viscosity modifier must be a solid aldehyde compound, and that it is clear that the claims are open to a viscosity modifier which is either a liquid aldehyde or a solid aldehyde.

Appellant points out that this argument was made with respect to claim 10, and not claim 1.

In response to Appellant's position with respect to Malhotra et al., the Examiner has stated that while Malhotra et al. discloses benzaldehyde compounds as presently claimed but does not explicitly refer to these compounds as viscosity modifiers, given that the reference compounds are the same type as the compounds presently claimed, i.e., benzaldehydes, it would have been natural for one of ordinary skill in the art to infer that the reference compounds intrinsically function as viscosity modifiers, and thereby arrive at the claimed invention. Appellant points out, however, that nothing in this reference teaches that these materials should be added to an ink composition also containing an aldehyde copolymer ink vehicle. Those of ordinary skill in the art would not be led to the conclusion that one specific component of one specific ink should arbitrarily be taken and added to another specific ink, or that by so doing advantageous results would occur. There would be no motivation for one of ordinary skill in the art to add these materials to an ink containing an aldehyde copolymer ink vehicle.

In response to Appellant's position to the effect that Malhotra et al. does not disclose the time necessary for the ink to change from solid state to liquid state, the Examiner has stated that while it is agreed that the reference does not explicitly disclose the time required for the ink to change from the solid state to the liquid state, Malhotra et al. does disclose the melting point of the ink, that to the extent that the melting point represents the change from solid to liquid, and given that the melting temperature and the ink ingredients disclosed

by Malhotra et al. overlap those presently claimed, it is the Examiner's position that the ink of Malhotra et al. would intrinsically change from solid to liquid in the same time as presently claimed.

Appellant disagrees with this position. As stated hereinabove, Malhotra et al. fails to teach or suggest a hot melt or phase change ink of the composition recited in the instant claims. In addition, while melting point is measured in units of temperature, such as degrees, the time required for a material to undergo a change from the solid state to the liquid state is measured in units of time, such as milliseconds. Two materials with the same melting point can have substantially different melt times. Accordingly, since Malhotra et al. fails to teach either a composition as recited in the instant claims or a hot melt or phase change ink with a melt time as recited in claim 4, Appellant remains of the position that the present invention as recited in the instant claims is patentable with respect to the teachings of this reference, viewed either alone or in combination with other references.

Further in response to Appellant's position to the effect that Malhotra et al. does not disclose the time necessary for the ink to change from solid state to liquid state and that compositions with the same melting temperature do not necessarily possess the same melting time, the Examiner has stated that while Appellant argues that compositions with the same melting temperature do not necessarily possess the same melting time, it is noted that not only does the ink composition of Malhotra et al. possess the same melting temperature as presently claimed, the ink composition of Malhotra et al. taken in view of either Schwarz et al. or Siddiqui and Watt comprises the same ingredients

as presently claimed, i.e. aldehyde copolymer, nonpolymeric aldehyde viscosity modifier, ink vehicle, and colorant, and that in light of this, and absent evidence to the contrary, it is the Examiner's position that the ink composition disclosed by Malhotra et al. taken in view of either Schwarz et al., Siddiqui, or Watt would possess the same melting time as presently claimed.

Appellant disagrees with this position. Functional language in a claim must not be ignored. See, e.g., In re Caldwell, 319 F.2d 254, 138 U.S.P.Q. 243 (C.C.P.A. 1963). As the court held in In re Swinehart, 439 F.2d 210, 169 U.S.P.Q. 226 (C.C.P.A. 1971), there is nothing wrong with attempting to define something (in the Swinehart case, a composition) by what it does rather than by what it is (as evidenced by specific structure or material, for example). Claims such as instant claim 4, which recites an ink that undergoes, upon heating, a change from a solid state to a liquid state in a period of no more than about 100 milliseconds, encompass only those compositions that exhibit this functional characteristic. Nothing in Malhotra et al., viewed either alone or in combination with Schwarz et al., Siddiqui, or Watt teaches or suggests selecting the ink ingredients so that this functional limitation is met. Accordingly, Appellant is of the position that claim 4 is particularly in condition for allowance with respect to the teachings of these references.

B. Whether claims 6 and 16 are patentable under 35 U.S.C. §103(a) over Malhotra et al. in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al. and further in view of Tobias et al. (U.S. Patent 5,286,288).

Tobias et al. discloses a hot melt ink composition for use in continuous ink jet printing comprising an electrolyte, an electrolyte-solvating and dissociating compound, and an image-forming agent, said ink being solid at about 25°C, said ink liquefying at a temperature between 75°C and 175°C, and said ink in the liquid stage having a conductivity of greater than about 100 microsiemens/cm.

The Examiner has stated that the difference between the cited references and the present claimed invention is the requirement in the claims of conductivity and the amount of conductivity enhancing agent, that Tobias et al., which is drawn to hot melt inks, discloses the use of 0.1 to 5 percent conductivity agents to control the conductivity of the ink from 500 to 1500 microsiemens per centimeter or approximately 8.7 to 9.2 log(picomho/cm), which ensures that the ink has sufficient conductivity to be ink jet printed successfully, and that it therefore would have been obvious to one of ordinary skill in the art to control the conductivity of the hot melt of Malhotra et al. via conductivity agents to produce an ink suitable for ink jet printing, thereby arriving at the claimed invention.

Appellant disagrees with this position. As stated hereinabove with respect to the rejection of claims 1 to 5, 8 to 13, and 17 to 21 under §103 as unpatentable over Malhotra in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al., this combination of references fails to teach or fairly to suggest to one of ordinary skill in the

art an ink composition comprising an aldehyde copolymer ink vehicle, a nonpolymeric aldehyde viscosity modifier, and a colorant. Tobias et al. teaches a hot melt ink containing an electrolyte and an electrolyte solvating and dissociating compound for use in continuous ink jet printing. One of ordinary skill in the art, upon viewing these references in combination, would not be led to arrive at a hot melt ink composition comprising (a) an aldehyde copolymer ink vehicle, (b) a nonpolymeric aldehyde viscosity modifier, (c) a colorant, (d) an optional conductivity enhancing agent, (e) an optional antioxidant, and (f) an optional UV absorber. Accordingly, Appellant is of the position that the present invention as recited in claims 6 and 16 is patentable with respect to these references.

In response to Appellant's position to the effect that Malhotra et al. viewed in combination with Tobias et al. would not lead one of ordinary skill in the art to the present invention, the Examiner has stated that given that Tobias et al. is drawn to hot melt inks as are Malhotra et al. and the present claims, and further given that Tobias et al. teaches that conductivity agents are used in hot melt inks to control the conductivity of the ink to a certain level to produce an ink which is suitable for use in an ink jet printer, a function especially relevant to both Malhotra et al. and the invention at hand, it is the Examiner's position that there is ample motivation to combine Malhotra et al. with Tobias et al.

Appellant disagrees with this position. As stated hereinabove, Malhotra et al. does not teach or suggest a hot melt or phase change ink of the composition recited in the instant claims; Tobias et al. fails to remedy this deficiency in the teachings of Malhotra et al. In

addition, Malhotra et al. teaches solid inks for use in acoustic ink jet printing, while Tobias et al. teaches hot melt inks for use in continuous ink jet printing. The conductivity of the ink is very important in continuous ink jet printing, but nothing in Malhotra et al. teaches or suggests that the conductivity of a solid ink for use in acoustic ink jet printing is of any importance. Accordingly, Appellant remains of the position that one of ordinary skill in the art would not be motivated to combine the teachings of Malhotra et al. with the teachings of Tobias et al., and that even if these teachings were so combined, one of ordinary skill in the art would not be led to arrive at the instantly claimed invention.

C. Whether claim 7 is patentable under 35 U.S.C. §103(a) over Malhotra et al. in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al. and further in view of Nishizaki et al. (U.S. Patent 6,022,910).

Nishizaki et al. discloses a hot melt solid ink composition comprising at least one polyamide and at least one terpene resin. The terpene resin is present in an amount of from 0.5 percent by weight to 15 percent by weight based on the total weight of the ink composition. This hot melt solid ink composition can be stable to heat upon recording using ink jet recording apparatus where ink is heated to melt at a temperature higher than ordinary temperature to make a record, and has a superior transparency and a superior adhesion to printing mediums.

The Examiner has stated that the difference between the cited references and the present claimed invention is the requirement in the claims of the haze value of the ink, that given that

Malhotra et al. in view of Siddiqui and Watt disclose an ink with similar ingredients to those presently claimed, it is natural to infer that the ink intrinsically possesses haze values as presently claimed, that Nishizaki et al., which is drawn to hot melt inks, discloses that hot melt inks having haze values of 0 to 30 exhibit superior light transmission properties, especially when printed on OHP sheets, and that in light of the disclosure of Nishizaki et al. it would have been within the skill level of one of ordinary skill in the art to vary the specific types and amounts of ingredients present in the ink of Malhotra et al. to produce an ink having haze values of 0 to 30 to produce an ink with superior light transmission properties, thereby arriving at the claimed invention.

Appellant disagrees with this position. As stated hereinabove with respect to the rejection of claims 1 to 5, 8 to 13, and 17 to 21 under §103 as unpatentable over Malhotra in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al., this combination of references fails to teach or fairly to suggest to one of ordinary skill in the art an ink composition comprising an aldehyde copolymer ink vehicle, a nonpolymeric aldehyde viscosity modifier, and a colorant. Nishizaki et al. teaches a hot melt ink containing a polyamide resin and a terpene resin, and teaches that the ink has a haze of 0 to 30. One of ordinary skill in the art, upon viewing these references in combination, would not be led to arrive at a hot melt ink composition comprising (a) an aldehyde copolymer ink vehicle, (b) a nonpolymeric aldehyde viscosity modifier, (c) a colorant, (d) an optional conductivity enhancing agent, (e) an optional antioxidant, and (f) an optional UV absorber. Accordingly,

Appellant is of the position that the present invention as recited in claim 7 is patentable with respect to these references.

In response to Appellant's position to the effect that Nishizaki et al. discloses styrene and terpene polymers and not aldehyde copolymers as presently claimed, the Examiner has stated that while Nishizaki et al. do not disclose all of the features of the present claimed invention, Nishizaki et al. is used as a teaching reference that teaches a certain concept, namely that hot melt inks typically possess certain haze values, and in combination with the primary reference, discloses the presently claimed invention.

Appellant disagrees with this position. The Examiner appears to have cited Nishizaki et al. solely because it has certain physical characteristics that are similar to those of the instantly claimed inks. The possibility that one of ordinary skill in the art could look at Malhotra et al., Schwarz, Siddiqui, Watt, and Takazawa et al., derive therefrom a composition similar to that recited in instant claim 1, and then conclude that this ink would have physical characteristics similar to those of the Nishizaki et al. ink, which has a completely different composition, is so slight as to be insignificant. Further, as discussed hereinabove, since none of these references, viewed alone or in combination, teach or suggest an ink composition as recited in instant claim 1, even if these references were viewed in combination, one of ordinary skill in the art would not be led to arrive at the present invention.

Further in response to Appellant's position to the effect that there is no motivation to combine the teachings of Malhotra et al. with the teachings of Nishizaki et al., the Examiner has stated that given

that Malhotra et al. in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al. disclose an ink with similar ingredients to those presently claimed, i.e., aldehyde copolymer, nonpolymeric aldehyde, colorant, antioxidant, and UV absorber, it is natural to infer that the ink intrinsically possesses haze values as presently claimed absent any evidence to the contrary, and that to the extent that Nishizaki et al. discloses a hot melt ink comprising synthetic polymer and colorant suitable for use in ink jet printing and further discloses that such hot melt inks having a haze value of 0 to 30 exhibit superior light transmission properties, Nishizaki et al. remains a relevant reference against the present claims.

Appellant disagrees with this position. As discussed hereinabove, nothing in the combined teachings of Malhotra et al., Schwarz et al., Siddiqui, Watt, and Takazawa et al. teaches or suggests an ink composition as recited in the instant claims. In addition, functional language in a claim must not be ignored. See, e.g., In re Caldwell, 319 F.2d 254, 138 U.S.P.Q. 243 (C.C.P.A. 1963). As the court held in In re Swinehart, 439 F.2d 210, 169 U.S.P.Q. 226 (C.C.P.A. 1971), there is nothing wrong with attempting to define something (in the Swinehart case, a composition) by what it does rather than by what it is (as evidenced by specific structure or material, for example). Claims such as instant claim 7, which recites an ink that generates images having a haze value of no more than about 25, encompass only those compositions that exhibit this functional characteristic. Nothing in Malhotra et al., viewed either alone or in combination with Schwarz et al., Siddiqui, or Watt and further in combination with Nishizaki et al. teaches or suggests selecting the ink ingredients so that this functional limitation is met. Accordingly,

Appellant is of the position that claim 7 is particularly in condition for allowance with respect to the teachings of these references.

D. Whether claims 14 and 15 are patentable under 35 U.S.C. §103(a) over Malhotra et al. in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al. and further in view of Shacklette (U.S. Patent 5,378,403) and WO 93/22775.

Shacklette discloses a thermally stable electrically conductive conjugated polymer comprising a conjugated polymer cation such as a substituted or unsubstituted polyaniline doped with a dopant anion substituted with one or more polar groups such as hydroxy, the polar group having an electronegativity or an electropositivity such that said polar group or groups have a net polar group molar contribution greater than zero.

WO 93/22775 discloses a thermally stable electrically conductive polyaniline comprising a polyaniline homopolymer or copolymer doped with an organic phosphorus acid.

The Examiner has stated that the difference between Malhotra et al. in view of Siddiqui and Watt and the present claimed invention is the requirement in the claims of specific type of conductivity enhancing agent, that Shacklette discloses the use of polyaniline complexes with phosphonic or phosphinic acid to impart conductivity and enhanced thermal stability to polymers including formaldehyde-sulfonamide, that although there is no explicit disclosure that the complex is suitable for use in inks, it is well known in the art as found in state of the art references such as WO 93/22775 that these polyaniline-

phosphorus-containing acid complexes are suitable for use in inks, and that in light of the motivation for using specific type of conductivity enhancing agent disclosed by Shacklette and WO 93/22775, it would have been obvious to one of ordinary skill in the art to use this conductivity enhancing agent in the ink of Malhotra et al. to control the conductivity of the ink so that the ink is successfully ink jet printed, thereby arriving at the claimed invention.

Appellant disagrees with this position. As stated hereinabove with respect to the rejection of claims 1 to 5, 8 to 13, and 17 to 21 under §103 as unpatentable over Malhotra in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al., this combination of references fails to teach or fairly to suggest to one of ordinary skill in the art an ink composition comprising an aldehyde copolymer ink vehicle, a nonpolymeric aldehyde viscosity modifier, and a colorant. Nothing in Shacklette or WO 93/22775, viewed in combination with these references, teaches or suggests such an ink, and nothing in Shacklette or WO 93/22775 teaches or suggests that complexes of a dianiline and a phosphorus-containing acid would be suitable conductivity-enhancing agents for such an ink. One of ordinary skill in the art, upon viewing these references in combination, would not be led to arrive at a hot melt ink composition comprising (a) an aldehyde copolymer ink vehicle, (b) a nonpolymeric aldehyde viscosity modifier, (c) a colorant, (d) an optional conductivity enhancing agent, (e) an optional antioxidant, and (f) an optional UV absorber. Accordingly, Appellant is of the position that the present invention as recited in claims 14 and 15 is patentable with respect to these references.

E. Whether claims 23 and 24 are patentable under 35 U.S.C. §103(a) over Malhotra et al. in view of Watt.

With respect to the rejection of claims 23 and 24 under §103 as being unpatentable over Malhotra et al. in view of Watt, the Examiner has stated that Malhotra et al. discloses a hot melt ink possessing a melting temperature of 125 to 160°C, a melt viscosity of 5 to 20 centipoise, and an acoustic loss value of less than 100 decibels per millimeter, that the ink contains a colorant such as a dye or pigment, 0.5 to 10 percent antioxidant, and UV absorber, that the reference discloses an acoustic ink jet printing process, that the reference discloses the use of 1 to 55 percent compounds such as benzaldehyde, 3-methoxy benzaldehyde, 4-methoxy benzaldehyde, 3-methyl benzaldehyde, 2-hydroxy benzaldehyde, and cinnamaldehyde, and 5 to 97 percent compounds such as 2,3,4-trimethoxybenzaldehyde, 3,5-dimethoxy benzaldehyde, 2,5-dimethoxy benzaldehyde, and 3-benzyloxy benzaldehyde, that Malhotra et al. discloses 2,3,4-trimethoxybenzaldehyde, 2-hydroxy benzaldehyde, and 3-benzyloxy benzaldehyde while the present claims require either 2,3,5-trimethoxybenzaldehyde, 2,3,6-trimethoxybenzaldehyde, ,2,4,5-trimethoxybenzaldehyde, 2,4,6-trimethoxybenzaldehyde, 3-hydroxy benzaldehyde, 4-hydroxy benzaldehyde, or 4-benzyloxy benzaldehyde, that in each case the only difference between the reference compounds and those presently claimed are the position of the substituents, i.e., ortho, meta, or para, that absent any evidence of criticality, one of ordinary skill in the art would expect the benzaldehyde

to function in the same manner regardless of the position of the substituents, that Malhotra et al. broadly discloses the use of benzaldehydes or, for instance, 3-methoxy benzaldehyde while the present claims require more specific types of benzaldehydes such as 4-hydroxy-3-methoxy benzaldehyde, that one of ordinary skill in the art would have recognized that the broad disclosure of benzaldehyde or 3-methoxy benzaldehyde encompasses the use of specific types of these compounds such as those presently claimed, and that the choice of these specific types of compounds would have been within the bounds of routine experimentation, and that the difference between Malhotra et al. and the present claimed invention is the requirement in the claims of (a) viscosity modifier and (b) aldehyde copolymer.

With respect to difference (a), the Examiner has stated that Malhotra et al. discloses benzaldehyde compounds as presently claimed but does not explicitly refer to these compounds as viscosity modifiers, and that given that the reference compounds are the same type as the compounds presently claimed, i.e. benzaldehydes, it would have been natural for one of ordinary skill in the art to infer that the reference compounds intrinsically function as viscosity modifiers and thereby arrive at the claimed invention. With respect to difference (b), the Examiner has stated that Watt, which is drawn to ink compositions, discloses the use of polyglycidyl ethers of formaldehyde as a binder, and that in light of the motivation for using aldehyde copolymers disclosed by Watt as described above, it would have been obvious to one of ordinary skill in the art to use these copolymers in the ink composition of Malhotra et al. to produce an ink with good flexibility and enhanced ejection from

the ink jet printer or, alternatively, improved adhesion to the substrate, and thereby arrive at the claimed invention.

Appellant disagrees with this position for the reasons set forth hereinabove with respect to the rejection of claims 1 to 5, 8 to 13, and 17 to 22 under §103 as being unpatentable over Malhotra et al. in view of either Schwarz et al. or Siddiqui, Watt, and Takazawa et al.

In the rejections of the claims under §103, the Examiner appears to have considered various portions of the references cited, in each instance viewing the cited portion in isolation from the context of the entire reference, and combined these isolated portions to arrive at the present invention with the benefit of hindsight. Using hindsight or applying the benefit of the teachings of the present application when determining obviousness, however, is impermissible; the references applied must be reviewed without hindsight, must be reviewed as a whole, and must suggest the desirability of combining the references. Lindemann Maschinenfabrik v. American Hoist & Derrick Co., 221 U.S.P.Q. 481 (Fed. Cir. 1984). None of the cited references suggests or teaches the desirability of combining the elements of the present invention as claimed. Obviousness cannot be established by combining references to arrive at the claimed invention, absent some teaching, suggestion, or incentive supporting the combination. In re Geiger, 2 U.S.P.Q. 2d 1276 (Fed. Cir. 1987); Carella v. Starlight Archery and Pro Line Co., 804 F.2d 135, 231 U.S.P.Q. 644 (Fed. Cir. 1986); ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 221 U.S.P.Q. (BNA) 929 (Fed. Cir. 1984).

When determining patentability under §103, the Examiner must consider the invention as a whole, and cannot view each element of the claim separately with respect to the prior art. See, e.g., Jones v. Hardy, __ F.2d __, 220 U.S.P.Q. 1021 (BNA) (Fed. Cir. 1984). When prior art references require selective combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself. Uniroyal Inc. v. Rudkin Wiley Corp., __ F. 2d __, 5 U.S.P.Q. 2d 1435 (Fed. Cir. 1988); Interconnect Planning Corp. v. Feil, 774 F. 2d 1132, 227 U.S.P.Q. 543 (Fed. Cir. 1985). It is impermissible to use the claims as a frame and the prior art references as a mosaic to piece together a facsimile of the claimed invention. Uniroyal Inc. v. Rudkin Wiley Corp., __ F. 2d __, 5 U.S.P.Q. 2d 1435 (Fed. Cir. 1988); W. L. Gore and Associates, Inc. v. Garlock, Inc., 721 F. 2d 1540, 220 U.S.P.Q. 303 (Fed. Cir. 1983).

Appellant directs the attention of the Board of Appeals to Ex Parte Levengood, 28 USPQ 2d 1300 (Bd. Pat. App. & Int. 1993), in which the Board reversed the rejection of all claims "because the examiner has used the wrong standard of obviousness.":

> "Obviousness is a legal conclusion, the determination of which is a question of patent law. In re Papesch, 315 F.2d 381, 137 USPQ 43 (CCPA 1963). In order to establish a *prima facie* case of obviousness, it is necessary for the examiner to present evidence[1], preferably in the form of some teaching, suggestion, incentive or inference in the applied prior art, or in the form of generally available knowledge, that one having ordinary skill in the art would have been led to combine the relevant teachings of the applied references in the proposed manner to arrive at the claimed invention. See, for example, Carella v. Starlight Archery, 804 F.2d 135, 231 USPQ 644 (Fed. Cir. 1986); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 227 USPQ 657 (Fed. Cir. 1985).
>
> ...

"...the examiner may provide an explanation based on logic and sound scientific reasoning that will support a holding of obviousness. In re Soli, 317 F.2d 941, 137 USPQ 797 (CCPA 1963)[2]...

...

"In this case, however, the only suggestion for the examiner's combination of the isolated teachings of the applied references improperly stems from appellant's disclosure and not from the applied prior art. In re Ehrreich, 590 F.2d 902, 200 USPQ 504 (CCPA 1979). At best, the examiner's comments regarding obviousness amount to an assertion that one of ordinary skill in the relevant art would have been able to arrive at appellant's invention because he had the necessary skills to carry out the requisite process steps. This is an inappropriate standard for obviousness. See Orthokinetics Inc. v. Safety Travel Chairs Inc., 806 F.2d 1565, 1 USPQ 2d 1081 (Fed. Cir. 1986). That which is within the capabilities of one skilled in the art is not synonymous with obviousness. Ex Parte Gerlach, 212 USPQ 471 (Bd. App. 1980). ... That one can reconstruct and/or explain the theoretical mechanism of an invention by means of logic and sound scientific reasoning does not afford the basis for an obviousness conclusion unless that logic and reasoning also supplies sufficient impetus to have led one of ordinary skill in the art to combine the teachings of the references to make the claimed invention.

"Our reviewing courts have often advised the Patent and Trademark Office that it can satisfy the burden of establishing a *prima facie* case of obviousness only by showing some objective teaching in either the prior art, or knowledge generally available to one of ordinary skill in the art, that 'would lead' that individual 'to combine the relevant teachings of the references.' In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). In re Newell, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989). Accordingly, an examiner cannot establish obviousness by locating references which describe various aspects of a patent applicant's invention without also providing evidence of the motivating force which would impel one skilled in the art to do what the patent applicant has done."

1. The importance of evidence in the examination process is set forth in the following quotation from In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984): 'The Supreme Court in Graham v. John Deere Co., 383 U.S. 1, 148 U.S.P.Q. 459 (1966), focused on the procedural and evidentiary processes in reaching a conclusion under section 103. As adapted to ex parte procedure, Graham is interpreted as continuing to place the 'burden of proof on the Patent Office which requires it to produce the factual basis for its rejection of an application under sections 102 and 103'. In re Warner, 379 F.2d 1011, 1016, 154 USPQ 173, 177 (CCPA 1967). After a *prima facie* case of obviousness has been established, the burden of going forward shifts to the applicant.

> 2. Preferably the examiner's explanation should be such that it provides that impetus necessary to cause one skilled in the art to combine the teachings of the references to make the proposed modification. In re Albrecht, 514 F.2d 1385, 185 USPQ 585 (CCPA 1975).

As the Court of Appeals for the Federal Circuit recently stated in Yamanouchi Pharmaceutical Co. v. Danbury Pharmacal Inc., 56 USPQ2d, 1641 (Fed. Cir. 2000) at 1644:

> This court has recently reemphasized the importance of the motivation to combine:
>
> > As this court has stated, "virtually all [inventions] are combinations of old elements." Therefore, an examiner [or accused infringer] may often find every element of a claimed invention in the prior art. If identification of each claimed element in the prior art were sufficient to negate patentability, very few patents would ever issue. Furthermore, rejecting patents solely by finding prior art corollaries for the claimed elements would permit an examiner [or accused infringer] to use the claimed invention itself as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention.
> >
> > . . . .
> >
> > . . . To counter this potential weakness in the obviousness construct, the suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness.
>
> In re Rouffet, 149 F.3d 1350, 1357-58, 47 USPQ2d 1453, 1457 (Fed. Cir. 1998) (internal citations omitted).

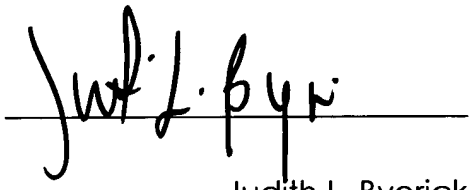
For the instant application, the Examiner also appears to have attempted to use the claimed invention as a blueprint for piecing together elements in the prior art to defeat the patentability of the claimed invention. This method is clearly impermissible. Nothing in any

of the cited references teaches or suggests the combination of elements recited in the instant claims.

CONCLUSION:

For the reasons set forth herein, Appellant is of the position that the claims of the present application are patentable with respect to the prior art cited by the Examiner, and accordingly respectfully requests that the Board of Patent Appeals and Interferences reverse the Examiner's rejections of the claims.

Respectfully submitted,



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9. APPENDIX:

CLAIMS APPEALED:

The following are the appealed claims:

1. A hot melt ink composition comprising (a) an aldehyde copolymer ink vehicle, (b) a nonpolymeric aldehyde viscosity modifier, (c) a colorant, (d) an optional conductivity enhancing agent, (e) an optional antioxidant, and (f) an optional UV absorber.

2. An ink composition according to claim 1 wherein the ink has a melting point of no lower than about 60°C and no higher than about 140°C.

3. An ink composition according to claim 1 wherein the ink has a melt viscosity at jetting temperature of no higher than about 25 centipoise.

4. An ink composition according to claim 1 wherein the ink undergoes, upon heating, a change from a solid state to a liquid state in a period of no more than about 100 milliseconds.

5. An ink composition according to claim 1 wherein the ink exhibits an acoustic-loss value of no more than about 100 decibels per millimeter.

6. An ink composition according to claim 1 wherein the ink exhibits a conductivity of no less than about 6 log(picomho/cm).

7. An ink composition according to claim 1 wherein images generated with the ink exhibit a haze value of no more than about 25.

8. An ink composition according to claim 1 wherein the aldehyde copolymer ink vehicle is poly ((phenyl glycidyl ether)-co-formaldehyde), poly ((o-cresyl glycidyl ether)-co-formaldehyde), poly (p-toluenesulfonamide-co-formaldehyde), or mixtures thereof.

9. An ink composition according to claim 1 wherein the ink vehicle is present in the ink in an amount of no less than about 1 percent by weight of the ink and no more than about 25 percent by weight of the ink.

10. An ink composition according to claim 1 wherein the nonpolymeric aldehyde viscosity modifier is 3-hydroxy benzaldehyde, 4-hydroxy benzaldehyde, 4-benzyloxy benzaldehyde, 2-carboxy benzaldehyde, 4-nitro benzaldehyde, 2,3-dihydroxy benzaldehyde, 2,5-dihydroxy benzaldehyde, 3-hydroxy-4-methoxy benzaldehyde, 4-hydroxy-3-methoxy benzaldehyde, 4-hydroxy-3-ethoxy benzaldehyde, 4-hydroxy-3-methyl benzaldehyde, 2-hydroxy-5-nitrobenzaldehyde, 3-hydroxy-4-nitrobenzaldehyde, 4-hydroxy-3-nitrobenzaldehyde, 3,4-dibenzyloxy benzaldehyde, 3,5-dibenzyloxy benzaldehyde, 4-acetoxy-3,5-dimethoxy benzaldehyde, 2-amino-3,5-dibromo benzaldehyde, 2-benzyloxy-4,5-dimethoxy benzaldehyde, 5-bromo-2-hydroxy-3-methoxy benzaldehyde, 4-hydroxy-3,5-dimethoxy benzaldehyde, 2,3,5-trichlorobenzaldehyde, 2,3,6-trichlorobenzaldehyde, 2,4,5-trimethoxy benzaldehyde, 2,4,6-trimethoxy benzaldehyde, 3,5-dichloro-2-hydroxy-benzaldehyde, 3,5-dibromo-2-hydroxy-benzaldehyde, 3,5-diiodo-2-hydroxy-benzaldehyde, 3,4-dihydroxy-5-methoxy benzaldehyde, 3,5-dimethyl-4-hydroxy benzaldehyde, 2,6-dimethoxybenzaldehyde, 2-nitro cinnamaldehyde, 4-(diethylamino) cinnamaldehyde, 4-acetoxy-3-methoxy cinnamaldehyde, 4-hydroxy-3-methoxy cinnamaldehyde, 2-hydroxy-1-naphthaldehyde, 2-methoxy-1-naphthaldehyde, 9-anthraldehyde, 5-bromo-2-furaldehyde, 5-nitro-2-thiophene carboxaldehyde, 9-ethyl-3-carbazole carboxaldehyde, 4-stillbene carboxaldehyde, 2-hydroxy-5-methyl-1,3-benzene dicarboxaldehyde, terephthal dicarboxaldehyde, 2-(diphenylphosphino) benzaldehyde, 1-(phenylsulfonyl)-2-pyrrolecarboxaldehyde, 1-pyrene carboxaldehyde,

phenanthrene carboxaldehyde, 2-fluorenecarboxaldehyde, or mixtures thereof.

11. An ink composition according to claim 1 wherein the viscosity modifier is present in the ink in an amount of no less than about 5 percent by weight of the ink and no more than about 95 percent by weight of the ink.

12. An ink composition according to claim 1 wherein the colorant is a dye.

13. An ink composition according to claim 1 wherein the colorant is a pigment.

14. An ink composition according to claim 1 containing a conductivity enhancing agent which is a complex of a dianiline and a phosphorus-containing acid.

15. An ink composition according to claim 1 containing a conductivity enhancing agent which is a complex of (a) a material which is 2,2'-dithio dianiline, 4,4'-dithiodianiline, 3,3'-methylene dianiline, 4,4'-methylene dianiline, N-methyl-4,4'-methylene dianiline, 4,4'-methylene bis(2,6-diethyl aniline), 4,4'-methylene bis(2,6-diisopropyl-N,N-dimethylaniline), 4,4'-methylene bis (N,N-dimethylaniline), 4,4'-methylene bis (2,6-dimethylaniline), 4,4'-methylene bis (3-chloro-2,6-diethylaniline), 3,3'-(sulfonyl bis(4,1-phenylene))dianiline, 4,4'-(1,3-phenylene diisopropylidene) bisaniline, or mixtures thereof, and (b) a material which is phenylphosphinic acid, dimethylphosphinic acid, methyl phosphonic acid, or mixtures thereof.

16. An ink composition according to claim 1 containing a conductivity enhancing agent in an amount of no less than about 2 percent by weight of the ink and no more than about 50 percent by weight of the ink.

17. An ink composition according to claim 1 containing an antioxidant in an amount of no less than about 0.25 percent by weight of the ink and no more than about 10 percent by weight of the ink.

18. A printing process which comprises incorporating an ink according to claim 1 into an ink jet printing apparatus, melting the ink, and causing droplets of the melted ink to be ejected in an imagewise pattern onto a recording sheet.

19. A process according to claim 18 wherein the printing apparatus employs an acoustic ink jet process, wherein droplets of the ink are caused to be ejected in imagewise pattern by acoustic beams.

20. A process according to claim 18 wherein the printing apparatus employs an acoustic ink jet printing process wherein droplets of the ink are formed by acoustic beams without imparting a substantial velocity component toward the print medium, using a droplet forming force that is sufficient only to form the ink droplets, and wherein the printing process further comprises generating an electric field to exert an electrical force different from the droplet forming force on the ink droplets to move the ink droplets toward the print medium, and controlling the electrical force exerted on the formed complete ink droplets by the electric field.

21. A hot melt ink composition consisting essentially of (a) an aldehyde copolymer ink vehicle, (b) a nonpolymeric aldehyde viscosity modifier having a melting point of no less than about 65°C, (c) a colorant, (d) an optional conductivity enhancing agent, (e) an optional antioxidant, and (f) an optional UV absorber.

23. An ink composition according to claim 1 wherein the aldehyde copolymer ink vehicle is poly ((phenyl glycidyl ether)-co-formaldehyde), poly ((o-cresyl glycidyl ether)-co-formaldehyde), or mixtures thereof.

24. An ink composition according to claim 1 wherein the aldehyde copolymer ink vehicle is poly ((phenyl glycidyl ether)-co-formaldehyde), poly ((o-cresyl glycidyl ether)-co-formaldehyde), poly (p-toluenesulfonamide-co-formaldehyde), or mixtures thereof and wherein the nonpolymeric aldehyde viscosity modifier is 3-hydroxy benzaldehyde, 4-hydroxy benzaldehyde, 4-benzyloxy benzaldehyde, 2-carboxy benzaldehyde, 4-nitro benzaldehyde, 2,3-dihydroxy benzaldehyde, 2,5-dihydroxy benzaldehyde, 3-hydroxy-4-methoxy benzaldehyde, 4-hydroxy-3-methoxy benzaldehyde, 4-hydroxy-3-ethoxy benzaldehyde, 4-hydroxy-3-methyl benzaldehyde, 2-hydroxy-5-nitrobenzaldehyde, 3-hydroxy-4-nitrobenzaldehyde, 4-hydroxy-3-nitrobenzaldehyde, 3,4-dibenzyloxy benzaldehyde, 3,5-dibenzyloxy benzaldehyde, 4-acetoxy-3,5-dimethoxy benzaldehyde, 2-amino-3,5-dibromo benzaldehyde, 2-benzyloxy-4,5-dimethoxy benzaldehyde, 5-bromo-2-hydroxy-3-methoxy benzaldehyde, 4-hydroxy-3,5-dimethoxy benzaldehyde, 2,3,5-trichlorobenzaldehyde, 2,3,6-trichlorobenzaldehyde, 2,4,5-trimethoxy benzaldehyde, 2,4,6-trimethoxy benzaldehyde, 3,5-dichloro-2-hydroxy-benzaldehyde, 3,5-dibromo-2-hydroxy-benzaldehyde, 3,5-diiodo-2-hydroxy-benzaldehyde, 3,4-dihydroxy-5-methoxy benzaldehyde, 3,5-dimethyl-4-hydroxy benzaldehyde, 2,6-dimethoxybenzaldehyde, 2-nitro cinnamaldehyde, 4-(diethylamino) cinnamaldehyde, 4-acetoxy-3-methoxy cinnamaldehyde, 4-hydroxy-3-methoxy cinnamaldehyde, 2-hydroxy-1-naphthaldehyde, 2-methoxy-1-naphthaldehyde, 9-anthraldehyde, 5-bromo-2-furaldehyde, 5-nitro-2-thiophene carboxaldehyde, 9-ethyl-3-carbazole carboxaldehyde, 4-stillbene carboxaldehyde, 2-hydroxy-5-methyl-1,3-benzene dicarboxaldehyde,

terephthal dicarboxaldehyde, 2-(diphenylphosphino) benzaldehyde, 1-(phenylsulfonyl)-2-pyrrolecarboxaldehyde, 1-pyrene carboxaldehyde, phenanthrene carboxaldehyde, 2-fluorenecarboxaldehyde, or mixtures thereof.